EFFECTIVENESS OF BRAIN GYM ON METACOGNITION, COGNITIVE ABILITY AND ACADEMIC ACHIEVEMENT OF STUDENT TEACHERS

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Synopsis Submitted to

Avinashilingam Institute for Home Science and Higher Education for Women,

Coimbatore – 641 043

In Partial Fulfilment of the Requirement for the Degree of

DOCTOR OF PHILOSOPHY IN EDUCATION

FEBRUARY 2025

14/2/25
(SUPERVISOR)

(HOD)

14/2/25
Dean
(School of Education)

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INTRODUCTION

Education bestows a renewed and enriched life upon individuals. It fosters human experience, comprehension, and adaptability, facilitating personal maturation. Education enriches individuals' lives, providing them with new perspectives and opportunities. Fagerlind and Saha (2016) defined education as the process of living by constantly recreating experience. It encompasses human experiences, insights, and adaptability, promoting personal growth. It also serves to inspire and empower individuals to adopt constructive behaviours. It is instrumental in fostering cognitive, emotional, and social development. Given the individuality of each learner, it is crucial for educators to implement a variety of teaching strategies that address the cognitive, affective, and psychomotor domains. To achieve this, teachers must be knowledgeable about both teacher-centred and learner-centred approaches. Understanding various teaching strategies is crucial for educators, particularly for those pursuing a career in teaching, such as student teachers. It is imperative for these individuals to be well-versed in diverse pedagogical approaches and instructional techniques. The Cognitive and Academic performance of these future educators is also vital to their development into proficient educators. Moreover, traditional teaching approaches tend to emphasize passive learning, often neglecting the significant role that physical activity plays in Cognitive development. Strategies that activate brain function can significantly improve Cognitive processes, Metacognition, and Academic success. Among these strategies, Brain Gym serves as a notable technique for enhancing brain activity.Recently; Metacognition has developed as a chief emphasis of research in cognitive psychology. There has been an increasing credit that Metacognition or self-awareness including awareness of oneself as a learner helps us to learn more efficiently. The concept created by Flavell in 1979 was expanded in several ways by Flavell in 1987.

IMPORTANCE OF BRAIN GYM

Brain Gym's approach of merging purposeful movement with cognitive engagement facilitates the activation of neural connections, thereby promoting enhanced self-regulation, reflective thinking, and problem-solving. The structured activities within the Brain Gym intervention strategy bolster cognitive flexibility, memory retention, and the efficiency of information processing, thus equipping the learners to perform better in academics.

Brain Gym, a concept pioneered by Paul E. Dennison and Gail E. Dennison in 1970, is rooted in the fields of applied neuroscience and cognitive science. It comprises a series of movements that are believed to activate brain function, promote neurological repatterning, and enable whole-brain learning (Dennison & Dennison, 1994). The initial framework of Brain Gym included 11 exercises specifically tailored for the holistic development of preprimary and primary students. In 2005, the Dennisons expanded this framework by introducing Educational Kinesiology (Edu-K), a movement-based methodology aimed at improving learning and brain performance, which further contributed to the refinement and application of Brain Gym exercises in educational settings. The theoretical contributions of Glenn Doman and Carl Delacato play a pivotal role in implementing Brain Gym as an educational intervention. This objective can be supported by institutional administrators and management, who should advocate for teacher collaboration and address classroom challenges with educational experts, psychologists, counselors, and authorities in educational theories and interventions (Marzano, R. J., Marzano, J. S., & Pickering, D. J., 2003). Modern educators require not only a comprehensive knowledge of their subject area but also effective classroom management skills to foster an appropriate learning environment.

NEED FOR THE STUDY

Engaging in Brain Gym exercises enables teachers to become facilitators in a learner-centered classroom, promoting an active and project-based approach that successfully achieves educational aims (Hart, 2004). It is crucial for educators to ensure that all students are prepared for learning, regardless of any external considerations or issues. Brain gym represents a technique aimed at improving metacognitive and cognitive skills, facilitating mental clarity and memory enhancement. According to Cohen (2009), this approach can significantly boost academic performance across various educational settings, ranging from preschool to higher education. Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., and Willingham, D. T. (2013) assert that enhancing students' interpersonal skills and cognitive capabilities can lead to an improved working environment. In this context, brain gym activities may serve as a valuable intervention across various educational settings, potentially elevating students' academic success rates.

STATEMENT OF THE PROBLEM

Brain Gym refers to a series of exercises focused on movement that are designed to improve cognitive functioning and has been proposed as a possible intervention to enhance

cognitive processing, self-regulation, and academic performance. Despite its significance, there is not much empirical research examining the efficacy of Brain Gym among student teachers. This gap in the literature prompted the researcher to explore the topic "Effectiveness of Brain Gym on Metacognition, Cognitive Ability, and Academic achievement of Student Teachers," with the expectation that the results will inform the creation of innovative pedagogical strategies that merge physical movement with cognitive development, ultimately benefiting the preparation of future educators.

OPERATIONAL DEFINITION OF KEY TERMS

Brain Gym is a series of simple physical body movements, done with intention and designed to stimulate Brain with the final aim of improving the brain functions. In the present study 33 exercises were considered under brain gym.

Metacognition refers to the awareness, understanding, and regulation of one's own cognitive processes. It involves two key components: Metacognitive Knowledge – The student teachers' awareness and understanding of their thinking processes, including knowledge of strategies, tasks, and self-efficacy in learning situations. Metacognitive Regulation – The ability to plan, monitor, and evaluate their learning and problem-solving strategies effectively. The assessment of Metacognition in this study is conducted by analyzing the scores of student teachers on the Metacognitive Awareness Inventory developed by Schraw and Dennison, consisting of 52 items.

Cognitive Abilities are brain-based skills which are needed in acquisition of knowledge, manipulation of information and reasoning. The cognitive abilities considered in the present study are Attention, Perception, Memory, Reasoning, Processing and Mobility.

Academic achievement refers to the extent of success a student achieves in their educational endeavours, which is commonly assessed through metrics such as grades, standardized test scores, the fulfillment of coursework requirements, and general performance in academic tasks. It signifies a student's ability to learn, retain, and effectively apply knowledge and skills in various subjects. In this study it pertains to scores achieved by the student teachers in the achievement test in Educational psychology, which was constructed and validated by the investigator.

Student teachers are those who are pursuing Bachelor of Education Programme after their graduation or post-graduation programme in the recognized Institution

OBJECTIVES OF THE STUDY

Objectives are categorized under three heads:

Development and Validation:

To construct and validate Brain Gym module

To develop and validate a previous knowledge test in Educational Psychology.

To construct and validate a Cognitive ability test.

To develop and validate an Acheivement Test in Educational Psychology

Relationship Analysis:

To find out the relationship between Metacognition, Cognitive ability and Academic Acheivement of student Teachers.

Comparative Analysis:

To compare the effectiveness of Brain gym and traditional method of teaching on Metacognition, Cognitive ability and Academic Acheivement of student Teachers

To compare the effectiveness of Brain gym and traditional method of teaching on Metacognition, Cognitive ability and Academic acheivement of student Teachers based on their Gender, Age, Qualification and Subject specialization.

To find out the retention effect of Brain Gym on Metacognition, Cognitive Ability and Academic achievement among student teachers.

HYPOTHESES

H0: 1 There exists no significant difference between the pre intervention mean scores of the student teachers taught through Brain Gym and traditional method of teaching in Metacognition, Cognitive ability and Academic achievement.

H0: 2 There exists no significant difference between the mean scores in post intervention scores of student teachers taught through Brain Gym and traditional method of teaching in Metacognition, Cognitive ability and Academic achievement.

H0: 3 There exists no significant difference between the mean scores of student teachers taught by traditional method of teaching before and after intervention in Metacognition, Cognitive ability and Academic achievement.

H0: 4 There exists no significant difference between the mean scores of student teachers taught by Brain Gym before and after the invention in Metacognition, Cognitive ability and Academic achievement.

H0: 5 There exists no significant difference between the mean scores in pretest and Delayed Post test in Metacognition, Cognitive ability and Academic achievement of experimental group and control group.

H0:6 There exists no significant difference between the mean scores in posttest and Delayed Posttest in Metacognition, Cognitive ability and Academic achievement of experimental group and control group

H0: 7 There exists no significant difference in the Metacognition, Cognitive ability and Academic achievement among student teachers based on Gender, Age, Qualification, and Subject specialization.

METHODOLOGY

Method used in the present study:

The experimental method is chosen for the present study. An experiment is a procedure carried out to support, refute, or validate a hypothesis. Experiments allow for precise control of variables; it can be replicated. In the present study, Pre-test-Post-test Non Equivalent Control Group Design was employed to examine the Effectiveness of Brain Gym on Metacognition, Cognitive ability, and Academic achievement of Student Teachers. The experimental group received instruction incorporating Brain Gym exercises, while the control group followed Traditional teaching method namely lecture method. Both groups underwent a pre-test prior to the intervention and a post-test following the intervention to evaluate any changes in Metacognition, Cognitive ability, and Academic achievement.

Variables used in the study

- Brain Gym based instruction and Traditional method of teaching are the independent variables.
- Metacognition, Cognitive ability and Academic achievement are the dependent variables.

Locale and Sample of the study

The present study is conducted in Coimbatore, Tamil Nadu, India .The study was done in Dr. SNS College of Education, a renowned teacher education institution located in

Coimbatore. The college is affiliated with Tamil Nadu Teachers Education University (TNTEU) and is recognized for its commitment to quality teacher training and educational research. It offers Bachelor of Education (B.Ed.) program, equipping student teachers with pedagogical knowledge, skills, and competencies required for effective teaching.

The sample for the study consisted of 191 student teachers of which the control group had 96 student teachers and experimental group with 95 student teachers.

Tools and materials used in the study

Appropriate tools and materials are vital for successful research. The tools and materials vary in their design and interpretations. Each tool is suitable for the collection of specific information. The different materials and tools used for the study are:

- A Module on Brain Gym (Prepared and validated by G Maheswari and H.Indu 2020)
- Metacognitive Awareness Inventory (Schraw and Denison, 1994)
- Cognitive Ability test (Prepared and validated by G Maheswari and H.Indu 2020)
- Previous Knowledge test (Prepared and validated by G Maheswari and H.Indu 2020)
- Achievement test in Educational Psychology (Prepared and validated by G Maheswari and H.Indu 2020)

Planning and conduct of study

The present study aims to investigate the Effectiveness of Brain Gym on Metacognition, Cognitive Ability, and Academic Achievement of student teachers. The research follows a Pretest-Posttest Nonequivalent Control Group Design, as suggested by Koul (2012). The intervention was done for eight weeks, during which 33 Brain Gym exercises were implemented, focusing on enhancing cognitive functions, metacognitive awareness, and academic achievement. The experimental Group received Brain Gym intervention and control group was taught through Traditional method namely lecture method.

The intervention was conducted during the researcher's regular class hours as the investigator was teaching Educational Psychology for the sample considered to avoid interference with other academic activities and it was carried out for 8 weeks comprising of 6 sessions per week and each session was for one hour duration. Totally 33 Brain Gym exercises were implemented in the experimental group.

Each session involved structured Brain Gym activities designed to stimulate different brain regions. The Brain Gym intervention was designed to enhance three key brain areas—the cerebrum, cerebellum, and limbic system—through an integrated approach of laterality, centering, and focusing. Laterality, which involves the coordination between the left and right hemispheres of the cerebrum, strengthens logical reasoning, problem-solving, and comprehension, ensuring smooth communication between both sides of the brain. Centering focuses on the connection between the upper and lower brain, particularly engaging the cerebellum to improve coordination, balance, and spatial awareness, which are essential for maintaining posture and concentration. Focusing integrates the front and back regions of the brain. This structured activation of brain regions fosters a holistic learning experience.

DATA ANALYSIS

Statistical analysis was done by using different statistical methods specifically Descriptive analysis, Pearson's Correlation analysis, t-test (Independent and paired sample test), and One-way Analysis of Variance.

FINDINGS OF THE STUDY

- Descriptive analysis was conducted for the pre-test and post-test scores obtained from the scores of Metacognition, Cognitive Ability and Academic achievement of student teachers of the control and experimental group. The calculated values for the measures of central tendency, dispersion, and normality show that the data is not so scattered. Furthermore, the data demonstrates the characteristics of normality.

- Descriptive analysis was conducted to determine the levels of metacognition, cognitive ability and academic achievement among student teachers taught through traditional method. The findings indicate that the sample predominantly falls into the high category for metacognition, the average category for Cognitive ability and Academic acheivement , while the post test score analysis revealed that majority of the sample falls into high category for metacognition and academic achievement and in average category for cognitive ability .

- Correlation analysis indicated that there was significant relationship between Metacognition and Cognitive Ability, Metacognition and Academic achievement, Cognitive Ability and Academic achievement. This shows that there exists a linear, positive, strong correlation between these three selected variables.

- The pretest scores for metacognition, cognitive ability, and academic achievement were analyzed for both the control and experimental groups using an independent t-test. The resulting values of 0.511, 0.841, and 0.711, respectively, suggest that there are no significant differences in metacognition, cognitive ability, and academic achievement among the student teachers

- The t value obtained is 7.155, 7.128, and 5.077 in post test of Metacognition, cognitive ability and academic achievement of the control and experimental group. The results shows that the difference in the post test score is significant at .01 level. The mean score of experimental group is significantly higher than the control group denoting that the Brain Gym based intervention is effective in improving the Metacognition, Cognitive ability and Academic achievement of student teachers.

- The t-values calculated for the mean scores of the delayed post-test in Metacognition, Cognitive Ability, and Academic Achievement between the control and experimental groups are 7.230, 7.470, and 5.285, respectively. These results indicate that the differences in the delayed post-test scores are statistically significant at the .01 level. Furthermore, the mean scores of the experimental group are considerably higher than those of the control group. This suggests that the implementation of brain gym-based learning is effective in enhancing and sustaining the Metacognition, Cognitive Ability, and Academic Achievement of student teachers.

- The t values calculated for the pretest and delayed post-test in Metacognition, Cognitive Ability, and Academic Achievement, were .908, .743, and .584, respectively. The mean scores for both the pre-test and the delayed post-test in Metacognition and Cognitive Ability did not demonstrate significance at the .01 level. This suggests that the traditional instructional method fails to sustain the academic achievement of student teachers, resulting in no significant changes in their metacognitive skills and cognitive abilities and the t values conducted to test whether the mean post test score and delayed post test score obtained for the control group was also found to be not significant for Metacognition, Cognitive ability and Academic achievement.

- The mean pre-test and delayed post-test score of academic achievement of the experimental group is found to be 26.80 (SD = 9.24) and 35.06 (SD = 9.79) respectively. The t value obtained for the test of significance of difference in the two means is 18.970, which is greater than 2.58 hence it can be said that the application of Brain Gym

excercises has retention effect on the student teachers' Metacognition, Cognitive ability as well as their Academic achievement. table value at .01 level of significance.

- The test of significance of difference in the mean post-test and delayed post-test score of Metacognition and Academic achievement shows no significant difference. At the same time there exists a significant difference in the mean post-test and delayed post-test score of Cognitive ability of experimental group at .01 level of significance. Delayed post test score is found to be higher than the post-test score of Cognitive ability. This denotes that the module applied has great impact on the retention of the student teachers in terms of Cognitive ability.

- The t value obtained 0.553, 0.342 and 0.912 for pretest score of Metacognition, Cognitive ability and Academic acheivement respectively and shows no significant difference between male and female student teachers taught through traditional method of teaching.

- The test of significance difference in post test scores of Metacognition, Cognitive ability and Academic acheivement between female and male student teachers taught through traditional method is not significant at .05 % level. Whereas there is a significant difference in the Cognitive ability of student teachers taught through brain gym and the mean score shows that female student teachers had better Cognitive ability than the male students. But there was no significant difference in the male and female student teachers in Metacognition and Academic acheivement who were taught through Brain Gym.

- The t value obtained 0.684 ,0.059 ,0.921 for the post test scores of PG and UG qualified student teachers taught by the traditional method is found to be not significant for Metacognition ,Cognitive ability and Academic acheivement .It was also seen that t values 0.578,0.869,0.503 obtained by the student teachers taught through Brain Gym is also not significant .

- The examination of the subsample age aimed at determining the mean scores of Metacognition, Cognitive Ability, and Academic Achievement among student teachers instructed through both traditional methods and Brain Gym indicated that there is no statistically significant difference in the post-test scores.

- The results of the ANOVA done to test whether Metacognition ,Cognitive ability and Academic acheivement of student teachers changes significantly in terms of subject specialization for both control and experimental group. The results clearly depicts that

there exists no significance difference in the pretest scores and post test scores in the aforesaid variables of student teachers classified based on the subject specialization .This is true for experimental and control group

EDUCATIONAL IMPLICATIONS

- Brain Gym can break the monotony of classroom as there is physical participation which addresses the kinesthetic learners too.
- By incorporating Brain Gym into teacher training programs, educators can foster both mental and physical well-being, enhancing overall teaching effectiveness and as student teachers are trained in practicing brain gym they can transfer these skills in their future classroom teaching.
- Brain Gym exercises help student teachers develop greater self-awareness and control over their learning processes, leading to more effective teaching strategies.

RECOMMENDATION

- Educational institutions can incorporate Brain Gym exercises in teacher education programs to enhance cognitive abilities and metacognitive awareness among students.
- Workshops and training sessions can be organized for educators and student teachers to help them understand and apply Brain Gym techniques effectively in their teaching practices.
- Schools can introduce Brain Gym as part of daily routines to promote cognitive development and improve academic performance, especially before exams or during transitions between classes.
- Educational technology developers can explore creating digital versions of Brain Gym exercises, making them more accessible and engaging for teachers and students across various platforms.

SUGGESTIONS FOR FURTHER RESEARCH

- Future studies can explore the long-term impact of Brain Gym on diverse student populations, considering different academic levels, cultural contexts, and subjects.
- Studies on neuroimaging techniques like EEG or MRI to examine the brain activity changes resulting from Brain Gym exercises and their impact on cognitive function can be conducted.

- Studies to find out the efficacy of Brain Gym incorporated into technology-driven learning environments may be conducted.
- The role of Brain Gym in reducing stress, anxiety, and improving emotional intelligence, can be assessed.

CONCLUSION

The results of this research suggest that incorporating Brain Gym exercises positively influences metacognitive awareness, cognitive skills, and academic performance among student teachers. Those who participated consistently in Brain Gym activities exhibited notable improvements in their cognitive capabilities. These advancements were evident in their increased academic success, indicating that Brain Gym interventions may serve as an effective strategy for improving educational results within teacher training programs.

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INTERNET RESOURCES

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